

## REMARKS

With this response, claim 97 is amended. No claims are added or cancelled. Therefore, claims 40-97 are pending.

### Claim Objections

Claims 49, 55-56, 72, 88, and 92-93 were objected to as being dependent upon a rejected base claim. Applicants submit that all rejections of the base claims from which these claims depend have been overcome with this Response. Therefore, Applicants submit that the objection to these claims as being dependent on a rejected base claim has been overcome.

### Claim Rejections - 35 U.S.C. § 103

Claims 40-41, 44-46, 50-51, 53-54, 57-61, 63-64,  
68-69, 78-79, 81-82, 84-86, and 94-97

Claims 40-41, 44-46, 50-51, 53-54, 57-61, 63-64, 68-69, 78-79, 81-82, 84-86, and 94-97 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,037,898 issued to Parish et al. (*Parish*) in view of U.S. Patent No. 5,745,858 issued to Sato et al. (*Sato*). Applicants respectfully submit that these claims are not rendered unpatentable by *Parish* and *Sato* for at least the following reasons.

Claim 40 recites the following:

**iteratively processing a signal through a plurality of signal processing procedures to generate a plurality of processed signals; and sequentially transmitting the plurality of processed signals through a coupled antenna array, generating a desired radiation level at a number of locations within a desired sector.**

Thus, Applicants claim iteratively processing a signal through a plurality of signal processing procedures to generate a plurality of processed signals and sequentially transmitting the plurality of processed signals generated. Claim 60 recites a subscriber unit with elements similarly

directed to iteratively process a signal through a plurality of signal processing procedures to generate a plurality of processed signals and sequentially transmit the plurality of processed signals generated. Claim 78 recites a communication station with elements to iteratively process a signal through a plurality of signal processing procedures to generate a plurality of processed signals and sequentially transmit the plurality of processed signals generated.

*Parish* discusses processing signals with calibration factors to compensate the signals for the imperfections of the transmit or receive path. See Abstract; col. 3, lines 45 to 64 and col. 7, lines 8 to 30. *Parish* fails to disclose or suggest sequentially transmitting a generated plurality of processed signals as recited in claims 40, 60, and 78. The Office Action at page 3 asserts that "sequentially transmitting" is disclosed by *Parish* at col. 3, lines 45 to 53, which states:

It is known that compensation can be achieved by convolving each of the  $m$  signals received or transmitted by the antenna elements by a complex calibration function (i.e., by a complex valued time sequence), where each calibration function describes the transfer function correction required to compensate for the gain and phase errors a signal undergoes when passing through the transmit (or receive) apparatus chains. (Emphasis added)

Thus, the recited section of *Parish* discusses compensation of a single signal, and transmission of that compensated signal is implied. The fact that "each of the  $m$  signals" is compensated as described does not necessarily indicate that each of the  $m$  signals is transmitted sequentially.

Processing multiple signals by a complex valued time sequence does not necessarily require that the signals so processed are transmitted in sequence, or even transmitted in any particular order.

This section of *Parish* simply refers to how signals are calibrated along the transmit path in preparation for transmission. The fact that the calibration function is a "complex valued time sequence" is presumably only an example of calibration of the signal in the time domain, as opposed to a calibration of the signal in the frequency domain, and does not refer to any particular order in which the signals will be transmitted. See col. 3, lines 17 to 34 and col. 3, line

64 to col. 4, line 17. In contrast, Applicants claim sequentially transmitting a plurality of processed signals, all processed signals generated from the same signal, utilizing a plurality of signal processing procedures. Therefore, *Parish* fails to disclose or suggest sequentially transmitting as Applicants claim in claims 40, 60, and 78.

*Sato* discusses utilizing signal processing to vary directivities of antenna elements of an antenna array to avoid cochannel interference. See Abstract; Summary. *Sato* likewise fails to disclose or suggest sequentially transmitting a plurality of processed signals generated from a signal. Thus, *Sato* fails to cure the deficiencies of *Parish* discussed above.

Furthermore, the Office Action asserts that "iteratively processing a signal to generate a plurality of processed signals" is disclosed by *Parish* at col. 8, lines 37 to 44, which states:

Signal processors 119 and 123 may be static (always the same), dynamic (changing depending on desired directivity), or smart (changing depending on received signals), and in the preferred embodiments are adaptive. Signal processors 119 and 123 may be the same one or more DSP devices with different programming for the reception and transmission, or different DSP devices, or different devices for some functions, the same for others.

Applicants respectfully submit that merely reciting a system that includes multiple processors fails to show iteratively processing a signal as claimed. Thus, the Office Action fails to distinctly set forth anything in *Parish* that discloses or suggests iteratively processing a signal to generate a plurality of processed signals, as recited in claims 40, 60, and 78. *Sato* fails to cure the deficiencies of *Parish* at least because *Sato* similarly fails to disclose or suggest iteratively processing a signal to generate a plurality of processed signals as recited in claims 40, 60, and 78. Therefore, Applicants respectfully submit that the cited references, either alone or in combination, fail to disclose or suggest each and every element of the claims.

Claims 41, 44-46, 50-51, 53-54, 57-59, and 95 depend from claim 40. Claims 61, 63-64, 68-69, and 96-97 depend from claim 60. Claims 79, 81-82, 84-86, and 94 depend from claim 78.

Because dependent claims necessarily include the limitations of the claims from which they depend, Applicants submit that these claims are not anticipated by *Parish* and *Sato* for at least the reasons discussed above.

Claims 40-41, 44-46, 50-51, 53-54, 57-61, 63-64,  
68-69, 78-79, 81-82, 84-86, and 94-97

Claims 42-43, 47-48, 52, 62, 65-67, 70-71, 73-77, 80, 87, and 89-91 were rejected under 35 U.S.C. § 103(a) as being unpatentable over *Parish* and *Sato*, and further in view of U.S. Patent No. 5,708,971 issued to Dent (*Dent*). Applicants respectfully submit that these claims are not rendered unpatentable by *Parish* and *Sato* for at least the following reasons.

The Office Action at pages 4 to 5 cites *Dent* as disclosing non-null levels of antenna transmission. Without adopting the Office Action's characterization of *Dent*, and without needing to provide a characterization of *Dent*, Applicants respectfully submit that *Dent* fails to cure the deficiencies of *Parish* and *Sato*, as discussed above, at least because *Dent* similarly fails to disclose or suggest iteratively processing a signal to generate a plurality of processed signals as recited in claims 40, 60, and 78. Therefore, Applicants respectfully submit that claims 42-43, 47-48, 52, 62, 65-67, 70-71, 73-77, 80, 87, and 89-91, which depend from claims 40, 60, and 78, are not rendered unpatentable by *Parish*, *Sato*, and *Dent* for at least the reason that the references, either alone or in combination, fail to teach or suggest each and every element of the claims.

### Conclusion

For at least the foregoing reasons, Applicants submit that all rejections have been overcome. Therefore, Applicants submit that claims 40-97 are in condition for allowance and such action is earnestly solicited. The Examiner is respectfully requested to contact the

undersigned by telephone if such contact would further the examination of the present application.

Please charge any shortages and credit any overcharges to our Deposit Account number 02-2666.

Respectfully submitted,  
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## AMENDMENTS WITH MARKINGS

### IN THE CLAIMS

40. (Once Amended) A method comprising:  
iteratively processing a signal through a plurality of signal processing procedures to generate a plurality of processed signals; and  
sequentially transmitting the plurality of processed signals through a coupled antenna array, generating a desired radiation level at a number of locations within a desired sector.
41. (Once Amended) A method according to claim 40, wherein the signal is transmitted using a CDMA protocol.
42. (Unchanged) A method according to claim 40, wherein the desirable radiation level is a non-null level.
43. (Once Amended) A method according to claim 40, wherein the desired sector is comprised of a range of azimuths up to a complete range of azimuths of the antenna array.
44. (Once Amended) A method according to claim 40, further comprising developing a plurality of signal processing procedures comprising:  
selecting a weight vector from a sequence of different weight vectors, wherein elements of the weight vectors selectively modify one or more characteristics of transmission of the signal from each antenna in the antenna array.
45. (Unchanged) A method according to claim 44, wherein the transmission characteristics include one or more of signal amplitude and/or phase.
46. (Unchanged) A method according to claim 45, wherein the sequence of weight vectors share an amplitude value and have random phase values.
47. (Unchanged) A method according to claim 45, wherein the sequence of weight vectors is comprised of weight vectors that are orthogonal.
48. (Unchanged) A method according to claim 47, wherein the orthogonal weight vectors have elements with the same magnitude.
49. (Unchanged) A method according to claim 47, wherein the orthogonal weight vectors are developed from one or more of rows or columns of a complex valued Walsh-Hadamard matrix, rows or columns of a real valued Hadamard matrix, and/or a sequence whose elements are basis vectors of a Fourier transform.

50. (Once Amended) A method according to claim 45, wherein the sequence of weight vectors is comprised of weight vectors designed to provide a desirable radiation pattern within at least a sub-sector of the desired sector.

51. (Unchanged) A method according to claim 50, wherein the desirable radiation pattern is a near omni-directional radiation pattern.

52. (Once Amended) A method according to claim 50, wherein the desired sector is the whole range in azimuth.

53. (Once Amended) A method according to claim 45, wherein the sequence of weight vectors includes weight vectors that are representative of weight vectors designed for transmission to known communication unit(s).

54. (Once Amended) A method according to claim 53, wherein the weight vectors designed for transmission to known communication unit(s) are determined from spatial signature(s) associated with each of the communication unit(s).

55. (Unchanged) A method according to claim 45, wherein the weight vectors are determined from weight vectors designed for transmission to known subscriber unit(s) using a vector quantization clustering process.

56. (Unchanged) A method according to claim 55, the vector quantization clustering process comprising:

assigning an initial set of weight vectors as a current set of representative weight vectors;  
combining each designed for subscriber unit weight vector with its nearest representative weight vector in the current set, according to some association criterion;

determining an average measure of a distance between each representative weight vector in the current set and all weight vectors combined with that representative weight vector;

replacing each representative weight vector in the current set with a core weight vector for all the weight vectors that have been combined with that representative weight vector; and

iterative repeating the combining, determining and replacing steps until a magnitude of the difference between the average measure in a present iteration and the average distance in the previous iteration is less than a threshold.

57. (Once Amended) A method according to claim 40, wherein the plurality of signal processing procedures is commensurate with the plurality of antennae within the antenna array used to sequentially transmit the plurality of processed signals.

58. (Unchanged) A storage medium comprising content which, when executed by an accessing machine, implements a method according to claim 40.

59. (Unchanged) A wireless communication system element comprising:  
a storage medium including content; and  
a processor element, coupled with the storage medium, to execute at least a subset of the content to implement a method according to claim 40.

60. (Once Amended) A subscriber unit comprising:  
two or more antenna configured as an antenna array; and  
processing element(s), coupled with the antenna array, to iteratively process a signal through a plurality of signal processing procedures to generate a plurality of processed signals which, when sequentially transmitted via the antenna array, generate a desired radiation level at a number of locations within a desired sector.

61. (Unchanged) A subscriber unit according to claim 60, wherein the processing element(s) are comprised of one or more of an application specific integrated circuit (ASIC), a digital signal processor (DSP), a field-programmable logic array (FPGA) and/or a microcontroller resident within the subscriber unit.

62. (Once Amended) A subscriber unit according to claim 60, further comprising:  
a transceiver, coupled with the antenna array and the processor element(s), to sequentially transmit each of the generated plurality of processed signals to achieve the desired radiation level at a number of locations in the desired sector during at least one of said sequential transmissions, wherein sequential transmission of the generated plurality of processed signals comprises a broadcast transmission.

63. (Unchanged) A subscriber unit according to claim 62, wherein the processor element(s) are integrated within the transceiver.

64. (Unchanged) A subscriber unit according to claim 63, wherein the transceiver comprises at least one processor element for each antenna within the antenna array.

65. (Unchanged) A subscriber unit according to claim 60, wherein the processor element(s) select a radiation level that is a non-null level.

66. (Unchanged) A subscriber unit according to claim 60, wherein the desired sector is comprised of a range of azimuths up to a complete range of azimuths of the antenna array.



67. (Unchanged) A subscriber unit according to claim 66, wherein the processor element(s) select a weight vector from a sequence of different weight vectors to develop the processing procedure, wherein elements of the weight vectors selectively modify one or more characteristics of transmission of the signal from each antenna in the antenna array.

68. (Unchanged) A subscriber unit according to claim 67, wherein the transmission characteristics include one or more of a signal amplitude and/or phase.

69. (Unchanged) A subscriber unit according to claim 67, wherein the sequence of weight vectors share an amplitude value and have random phase values.

70. (Unchanged) A subscriber unit according to claim 67, wherein the sequence of weight vectors are comprised of weight vectors which are orthogonal to one another.

71. (Unchanged) A subscriber unit according to claim 70, wherein the orthogonal weight vectors share a common magnitude.

72. (Unchanged) A subscriber unit according to claim 70, wherein the processor element(s) develop the orthogonal weight vectors from one or more of rows or columns of a complex valued Walsh-Hadamard matrix, rows or columns of a real valued Hadamard matrix, and/or a sequence whose elements are basis vectors of a Fourier transform.

73. (Unchanged) A subscriber unit according to claim 67, wherein the sequence of weight vectors is comprised of weight vectors designed to provide a desirable radiation pattern within at least a sub-sector of an overall desired sector.

74. (Unchanged) A subscriber unit according to claim 73, wherein the processor element(s) develop the sequence of weight vectors designed to provide a desirable radiation pattern based, at least in part, on information associated with known communication station(s) in the desired sector.

75. (Unchanged) A subscriber unit according to claim 74, wherein the processor elements develop the sequence of weight vectors from spatial signature(s) associated with the known communication station(s).

76. (Unchanged) A subscriber unit according to claim 74, wherein the processor element(s) develop the sequence of weight vectors using a vector quantization clustering process.

77. (Unchanged) A subscriber unit according to claim 70, wherein the processor element(s) develop a plurality of signal processing procedures commensurate with the plurality of antennae comprising the antenna array.

78. (Once Amended) A communication station comprising:  
two or more antenna configured as an antenna array; and  
processing element(s), coupled with the antenna array, to iteratively process a signal through a plurality of signal processing procedures to generate a plurality of processed signals which, when sequentially transmitted via the antenna array, generate a desired radiation level at a number of locations within a desired sector.

79. (Unchanged) A communication station according to claim 78, wherein the processing element(s) are comprised of one or more of an application specific integrated circuit (ASIC), a digital signal processor (DSP), a field-programmable logic array (FPGA) and/or a microcontroller resident within the communication station.

80. (Once Amended) A communication station according to claim 78, further comprising:

one or more transceivers, coupled with the antenna array and the processor element(s), to sequentially transmit each of the generated plurality of processed signals to achieve the desired radiation level at a number of locations in the desired sector during at least one of said sequential transmissions, wherein sequential transmission of the generated plurality of processed signals comprises a broadcast transmission.

81. (Unchanged) A communication station according to claim 80, wherein the processor element(s) are integrated within one or more of the transceiver(s).

82. (Unchanged) A communication station according to claim 80, wherein the transceiver comprises at least one processor element for each antenna within the antenna array.

83. (Unchanged) A communication station according to claim 78, wherein the desired sector is comprised of a range of azimuths up to a complete range of azimuths of the antenna array.

84. (Unchanged) A communication station according to claim 78, wherein the processor element(s) select a weight vector from a sequence of different weight vectors to develop the processing procedure, wherein elements of the weight vectors selectively modify one or more characteristics of transmission of the signal from each antenna in the antenna array.

85. (Unchanged) A communication station according to claim 84, wherein the transmission characteristics include one or more of a signal amplitude and/or phase.

86. (Unchanged) A communication station according to claim 84, wherein the sequence of weight vectors share an amplitude value and have random phase values.

87. (Unchanged) A communication station according to claim 84, wherein the sequence of weight vectors are comprised of weight vectors which are orthogonal to one another.

88. (Unchanged) A communication station according to claim 87, wherein the processor element(s) develop the orthogonal weight vectors from one or more of rows or columns of a complex valued Walsh-Hadamard matrix, rows or columns of a real valued Hadamard matrix, and/or a sequence whose elements are basis vectors of a Fourier transform.

89. (Unchanged) A communication station according to claim 84, wherein the sequence of weight vectors is comprised of weight vectors designed to provide a desirable radiation pattern within at least a sub-sector of an overall desired sector.

90. (Unchanged) A communication station according to claim 89, wherein the processor element(s) develop the sequence of weight vectors designed to provide a desirable radiation pattern based, at least in part, on information associated with known subscriber unit(s) in the desired sector.

91. (Unchanged) A communication station according to claim 90, wherein the processor elements develop the sequence of weight vectors from spatial signature(s) associated with the known subscriber unit(s).

92. (Unchanged) A communication station according to claim 90, wherein the processor element(s) develop the sequence of weight vectors using a vector quantization clustering process.

93. (Unchanged) A communication station according to claim 92, wherein performing the vector quantization cluster process, the processor element(s):

- assign an initial set of weight vectors as a current set of representative weight vectors;
- combine each designed for subscriber unit weight vector with its nearest representative weight vector in the current set, according to some association criterion;
- determine an average measure of a distance between each representative weight vector in the current set and all weight vectors combined with that representative weight vector;
- replace each representative weight vector in the current set with a core weight vector for all the weight vectors that have been combined with that representative weight vector; and

iteratively repeat the combining, determining and replacing elements until a magnitude of the difference between the average measure in a present iteration and the average distance in the previous iteration is less than a threshold.

94. (Unchanged) A communication station according to claim 78, wherein the processor element(s) develop a plurality of signal processing procedures commensurate with the plurality of antennae comprising the antenna array.

95. (Unchanged) A method according to claim 53 wherein the communication unit(s) is at least one of a subscriber unit and a base station.

96. (Unchanged) A subscriber unit according to claim 60 wherein the signal is transmitted using a CDMA protocol.

97. (Once Amended) A communication station according to claim [60] 78 wherein the signal is transmitted using a CDMA protocol.